
Maintaining Nutrition Security and Diet Quality: The Role of the Food Stamp Program and WIC

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We examine the contribution of the Food Stamp Program (FSP) and the Special Supplemental Program for Women, Infants, and Children (WIC) to the nutrition security and diet quality of low-income participating households. This information can improve future monitoring of the effects of welfare policy reforms. Welfare reform has emphasized moving people from welfare to work and modifying or eliminating many former entitlement programs. However, after debate, Federal food assistance programs were retained as a nutritional safety net, although in some cases access and benefits were restricted. Using historical consumption data (CSFII 1989-91), we examine the hypothesis that participation in the FSP and/or WIC is an important factor in maintaining and improving the diet quality of low-income households. Using USDA's Healthy Eating Index (HEI), as an indicator of overall diet quality, and its 10 component indices, we estimate for the first time overall diet quality effects of changes in FSP and WIC participation and benefit levels. (The HEI permits us to examine diet quality as nutritionists see it—with some foods consumed too little and others too much.) Results suggest that both programs contribute significantly to maintaining and improving the nutritional well-being of low-income households, considering both quantity and quality of diet components. We believe the implication is that these food assistance programs help low-income households achieve nutrition security—including improved diet quality—and that their support provides a critical safety net to accompany welfare reform.

To examine relationships between diet quality and food program participation, we use USDA's 1989-91

Continuing Survey of Food Intakes by Individuals (CSFII) to analyze how the diet quality of low-income households is affected by participation in the Food Stamp Program (FSP) and the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). The measure of diet quality used is the USDA Healthy Eating Index (HEI), developed to assess the overall quality of individuals' diets, defined as the degree of adherence to Federal nutritional guidance (12,22). The Index consists of 10 equally weighted components that reflect how well individual diets conform to both the 1995 *Dietary Guidelines for Americans* (26) and the USDA *Food Guide Pyramid* (25) recommendations. Use of this index permits us to examine changes in diet quality associated with program benefits that may involve consuming less of particular dietary components and more of others.

For the first time, this article reports how responsive the HEI and its individual components are to participation in the FSP and WIC. To provide a context for the analysis that follows, we briefly describe the FSP and WIC within the framework of Federal food assistance. We then mention pertinent elements of welfare reform and food assistance program changes to indicate how legislative provisions may affect food assistance program participants. We present methods and results and discuss implications.

Overview and Background on Food Programs and Welfare Reform Context

The United States has a longstanding commitment to supporting food and nutrition security. Fourteen domestic food assistance programs comprise the formal Federal food and nutrition safety net and provide low-income consumers with foods, or with expanded means to purchase food products, along with nutrition information and education (table 1, p. 6).

Among the "modern" Federal programs that began in 1945 with the National School Lunch Program and, 53 years later, have grown to provide about \$37 billion annually (23), FSP and WIC are arguably the most significant in terms of benefits transferred and nutritional vulnerability of recipients, respectively. Advocates of the food assistance programs contend that they improve participants' diet quality and ameliorate public health. Despite welfare reform in late 1996, the structure of the Federal food programs was essentially preserved.

However, FSP eligibility criteria and benefit levels were severely curtailed for some key groups—including legal immigrants and able-bodied adults without dependents—and results of this analysis raise concerns about the potential, negative effects on diet quality of affected groups when, or if, access to these two important food and nutrition programs is reduced.

The FSP, an entitlement program, is the main food security program for low-income households and provides coupons or electronic benefit cards to enhance

recipients' food purchasing power and nutritional status. By FY 1996, the FSP provided \$24.3 billion in benefits to an average of 10 million households and 25.5 million individuals. In FY 1996, the average monthly benefit received was more than \$73 per person and more than \$172 per household (24). Over 80 percent of Food Stamp households contain either a child, elder, or disabled person, and 42 percent are single-parent households (24).

WIC is targeted to pregnant and postpartum (including breast-feeding) mothers, infants, and children up to 5 years of age at nutritional risk and serves more than 7 million people each month at an annual program cost of about \$3.7 billion. WIC provides a combination of services including nutrient-dense food packages, nutrition counseling, and access to health services. Approximately 45 percent of all infants and 25 percent of all pregnant women in the United States participate in the WIC Program (11). The value of the average 1995 WIC food package was \$43.12 per month, and the average monthly infant food package was \$73.74 (24). The most common foods included in the WIC packages are milk, cheese, infant formula, cereal for adults and infants, juice, peanut butter, dried beans, and eggs. In 1992, a WIC Farmers' Market Nutrition Program was created to provide additional coupons to WIC participants, which can be used to purchase fresh fruits and vegetables in farmers' markets. This is a relatively minor share of the WIC Program, constituting only about \$7 million of the \$3.7 billion total WIC benefits.

Table 1. Federal food assistance programs

Program name	Year begun	FY 1996 budget (in millions)	FY 1996 Participation
National School Lunch Program	1945	\$4,313	24,050,000 bunches per day
Special Milk Program	1955	\$16.8	144,246,000 total served
Food Stamp Program	1961 pilot 1974 permanent	\$24,330	25,540,000 recipients per month
Nutrition Program for the Elderly	1965	\$150	245,979,000 total meals
School Breakfast Program	1966 pilot 1975 permanent	\$1,118	6,103,000 daily average breakfasts served
Summer Food Service Program	1968	\$258	2,216,000 daily average attendance (July)
Commodity Supplemental Food Program	1968	\$100.2	357,000 average participation
Special Supplemental Program for Women, Infants, and Children (WIC)	1972 pilot 1974 permanent	\$3,730	Average participation 1,648,000 (women) 1,827,000 (infants) 3,712,000 (children)
Child and Adult Care Food Program	1975 pilot 1978 permanent 1989 adults	\$1,553	2,343,000 August average 1,546,171,000 total meals served
Food Distribution Program on Indian Reservations	1977	\$70	120,000 average
The Emergency Food Assistance Program	1981	\$44	40,899,000 total pounds distributed
Nutrition Assistance Program for Puerto Rico	1981	\$1,153	Not available
Homeless Children Program	1989	\$3	Not available
WIC Farmers Market Nutrition Program	1992	\$7 (of WIC total)	742,000 Federal 364,000 Non-Federal

Source: U.S. Department of Agriculture, Food and Nutrition Service. 1998. Administrative data.

The FSP and the WIC Program share some commonalities. Each transfers benefits to low-income individuals to enhance food consumption and diet quality. As an entitlement program, the FSP conveys food purchasing power to any low-income individual who meets eligibility criteria (based on means testing). Food purchases are relatively unrestricted. Nutrition education is a much smaller component of the FSP than of the WIC Program. By contrast, the WIC Program is not an entitlement program but targets specific priority subgroups of the low-income population as funds are appropriated. WIC provides vouchers for purchase of one of seven food baskets selected to be nutrient-dense and to supply specific nutrients deficient in the diets of the target participants. Unlike the FSP, WIC includes individual nutrition counseling along with a referral to other subsidized health services.

Evaluations of the effects of the two programs suggest generally that they have been successful. Food consumption surveys show that diets of the poor improved markedly between 1965-66 and 1977-78, a period marked by nationwide expansion of the FSP (5). Numerous studies have shown that the FSP has succeeded in transferring purchasing power to low-income consumers and has increased food expenditures and nutrient availability relative to the transfer of cash benefits (3,7,14,15).

Seventeen studies summarized by Fraker and cited by Rossi yielded estimates that out of each food stamp dollar, between \$0.17 and \$0.49 was spent on home-consumed food ("best estimate, \$0.30") compared with only \$0.05 to \$0.10 of each dollar of cash benefits transferred. Fraker found that food stamp participation significantly increased the household availability of calcium, vitamin C, and iron. Far fewer studies have demonstrated the link between program participation, individual intake data, and improved nutritional status. WIC Program evaluations from the inception have demonstrated WIC effectiveness in increasing birth weight, decreasing incidence of low birth weight and prematurity, improving hematological status, and/or improving nutrient intake (11,18,19).

Recent welfare reform includes replacement of Federal welfare payments with block grants to States (Temporary Assistance for Needy Families Program, or TANF), welfare time limits and caps, and State discretion among benefit types, levels, and eligibility standards. States are encouraged to promote work and move recipients from welfare to work. Legal immigrants were made ineligible for Federal TANF benefits. Major food assistance program changes passed in 1996 included reductions in food stamp benefits for able-bodied adults without dependents and elimination of Federal food stamps for most legal immigrants. (The President's 1998 Budget restores some immigrant FSP benefits.) In the welfare reform context, if lost food assistance and welfare benefits are replaced by increased earnings or other income, then net effects on dietary status may be more modest. If, however, food and welfare assistance losses are not offset, effects found here are likely to be illustrative.

Methodology

We use the Healthy Eating Index developed by the USDA Center for Nutrition Policy and Promotion as the indicator of individual and household overall diet quality. Based on the 1995 *Dietary Guidelines for Americans* and the *Food Guide Pyramid* (FGP), this index almost alone focuses on the consumption of foods rather than nutrients. Few indices focusing on the total diet exist (1,2,17,21) and most of these—with the exception of Patterson et al.—focus exclusively on consumption of nutrients.

The Healthy Eating Index has 10 equally weighted components, each based on different aspects of a healthful diet. The score of each component ranges between zero and 10 and the overall index, from zero to 100. The components can be grouped in terms of those that relate to adequacy or sufficiency, to moderation, and to variety in the diet. Specifically, Components 1 through 5 measure the degree to which a person's diet contains adequate servings of the 5 major food groups depicted in the FGP: Grains, vegetables, fruits, milk, and meats. Components 6 through 9 measure how well recommendations to moderate fat, saturated fat, sodium, and cholesterol are met. Component 6 is based on total fat consumption as a percentage of total food energy intake; component 7 is based on saturated fat consumption as a percentage of total food energy intake; component 8 is based on cholesterol intake; and component 9 is based on sodium intake. Finally, component 10 reflects the amount of variety in a person's diet. The HEI does not set overall limits on food energy consumed.

An individual's score in any of the food group components is based on the proportion of the recommended number of servings consumed for a given energy intake level. For instance, the average energy allowance for a 40-year-old female is 2,200 kilocalories, and the FGP indicates that at this energy level, 4 servings of vegetables per day are recommended. If a 40-year-old female consumes the recommended number of servings, she receives the maximum score of 10 in the vegetable category.

A person who consumes the recommended number of servings from any food group receives a maximum component score of 10. A person consuming no servings from a food group receives the minimum score of zero. Between zero and 10, the component score is calculated proportionately; for example, a person needing 6 servings from the grain category who consumed only half that many would achieve a score of 5. Food serving amounts were computed from food consumption data using factors derived from the serving size assumptions given in the FGP.

Calculation of scores for all food group (adequacy) components followed this procedure with actual servings compared with recommended servings based on the FGP. In each food group, once the maximum recommended number of servings is achieved, neither further credit nor penalties are awarded for additional servings consumed.

Components 6 to 9 measure moderation in the diet and are scored differently. Component 6 reflects how well total fat is limited in the diet: A score of 10

means total fat intake as a proportion of energy intake is 30 percent or less. The score declines to zero when this proportion reaches 45 percent. Between these two points, the scores decline proportionately. The score for saturated fat (component 7) is computed analogously to that for total fat, with a maximum score achieved at a ratio of less than 10 percent of energy from saturated fat and zero when the ratio is 15 percent or greater.

The component scores for cholesterol and sodium are each based on milligrams consumed. Cutoff points for a perfect score of 10 are set at 300 mg for cholesterol and 2,400 mg for sodium. The corresponding zero points are 450 mg and 4,800 mg for cholesterol and sodium, respectively.

Finally, the *Dietary Guidelines*, as well as the National Academy of Sciences' *Diet and Health Report* (16), stress the importance of variety in the diet to help ensure that people get the nutrients they need. To assess variety, counting the total number of different foods eaten by an individual that contribute substantially to meeting one or more of the 5 food group requirements is necessary. Foods consumed were counted only if they amounted to at least one-half serving in any one food group. Identical food items eaten on separate occasions are summed before imposing the one-half serving cut-off. Similar foods such as two different forms of potatoes or two different forms of white bread count only once in the variety category. Mixtures are decomposed into constituent parts, meaning that a single food mixture (such as lasagna) could contribute

2 or more points to the variety index (contributing to both grain and meat, for example).

In the variety category, a person attains a score of 10 if 16 or more different foods are eaten over a 3-day period. If 6 or fewer distinct foods are eaten over a 3-day period, the individual earns zero. Here again, little guidance was available to suggest upper or lower limits in scoring variety; similar to categories 6 to 9, the limits for variety were derived by exploration of the consumption data and consultation with researchers. For a more detailed description of the construction of the HEI, see Kennedy et al. or U.S. Department of Agriculture (12,22).

Data

Data used in this study were collected in USDA's Continuing Survey of Food Intakes by Individuals (CSFII) 1989-91. The CSFII provides ongoing data on food and nutrient consumption with a yearly sample of about 2,000 households containing about 5,000 individuals. In CSFII 1989-91, 3 days of food and nutrient intake data (a 1-day recall followed by a 2-day diary) were obtained along with relevant demographic, economic, and Federal food program participation data. Food and nutrient consumption data from a separate low-income sample were also collected at the same time. The survey design was such that each year's data are nationally representative and can be used independently; however, the combined years provide a larger sample size. The low-income sample can be combined with the all-income sample through the use of survey weights. These survey weights

also adjust the survey sample to be representative of the U.S. population living in households. This analysis uses low-income households with complete data records in the combined 1989-90 sample (N=1,438); the HEI was not available for 1991.

Low-income households were those with annual income of 130 percent or less of the poverty threshold. There were 418 households participating in the FSP at the time of the survey. Of those, 359 had every household member authorized to receive food stamps. The remaining 59 FSP households with one or more members not authorized to receive food stamps were excluded from the analysis so as not to confound the relationships because of possible leakage of benefits (i.e., use of food purchased with food stamps by nonauthorized household members). This resulted in a final sample size of 1,379 households.

Statistical Model

A set of 11 reduced form equations was estimated including one HEI equation and one equation each for the 10 component dietary scores. This Ad Hoc reduced form specification was guided by household production theory (6) and previous studies of food and nutrient consumption in order to estimate net effects of the independent variables on the HEI and its components (2,10,13). Because the household is the unit of analysis in this study, each household member's HEI and component scores are totaled. These aggregated scores are the dependent variables. Independent variables are annual household income as a percentage of the poverty threshold; participation in the FSP; the weekly dollar value of food stamps received; participation by one or more household

members in the WIC Program; household size in Thrifty Food Plan Male Adult Equivalents (TFP MAEs);¹ headship status; the higher grade of formal schooling completed by either head of household; race; ethnic origin; geographic region and urbanization; and tenancy status. The number of household members who did not provide 3 days of dietary intake data, and thus lacked an HEI and component scores, was entered in the regression equation as an additional control. Because the HEI is, by construction, equal to the sum of its components, the 10 component equations' estimated coefficients were restricted to sum to the corresponding estimated coefficient of the HEI equation. This specification results in a potential gain in statistical efficiency. Restricted Ordinary Least Squares was used to estimate the models (9) and the SYSLIN procedure of the Statistical Analysis System (20) performed the estimation.

Results

Results include the means for the dependent and independent variables and the estimated regression coefficients as shown in table 2. The means are further subdivided by Food Stamp Program participation status. All means are weighted to represent population means of low-income households, and within those, of food stamp and nonfood stamp participating households. Means of the dependent variables are *per person* and are shown directly under the dependent variable name row.

¹To account for the households' varying age/sex compositions, a "Thrifty Food Plan Male Adult Equivalent Scale" was constructed by dividing each household member's maximum allotment given by the Thrifty Food Plan by that of a male 20 to 50 years of age. Then, the household size in TFP MAEs was constructed by summing over all household members.

...the value of food stamps received exerts a positive and statistically significant effect on vegetables, dairy, meat, and sodium component scores.... [and] participation in the WIC program...has a very strong positive effect on aggregate household diet quality....

Table 2. Weighted means and regression coefficients estimating relationships between household-level Healthy Eating Index and its components by food stamp receiving households and value of food stamps received and WIC participation controlling for other relevant variables, CSFII 1989-90

	Mean					
	All N=1,379	FSP N=359	NFSP N=1,020	HEI	Grains	Vegetables
Mean for All				62.18*	5.95	5.66
Mean for FSP				60.70	5.86	5.29
Mean for NFSP				62.74	5.99	5.79
Intercept				-12.69 0.00**	-1.85 0.05	-0.06 0.95
Income as percent of poverty threshold	81.89	65.71	87.93	-0.01 0.63	0.00 0.74	0.01 0.18
Food stamp participating household	0.27	1.00		-3.86 0.03	-0.28 0.59	-0.49 0.42
Weekly value of food stamps received	9.30	34.22		0.22 0.00	0.00 0.95	0.03 0.02
Household member participates in WIC	0.08	0.19	0.05	23.45 0.00	4.20 0.00	1.19 0.06
Household size in TFP MAEs	2.13	2.29	2.07	73.00 0.00	8.27 0.00	6.08 0.00
Dual-headed household	0.34	0.20	0.39	1.12 0.54	-1.30 0.01	1.66 0.01
Female-headed household	0.53	0.71	0.46	10.67 0.00	-0.19 0.67	0.92 0.07
Highest grade completed	10.59	10.16	10.76	0.81 0.00	0.04 0.39	0.00 0.97
African American	0.23	0.33	0.19	-5.16 0.00	-0.54 0.15	-0.65 0.12
Other race	0.06	0.08	0.06	-4.16 0.05	-0.29 0.64	0.25 0.73
Hispanic ethnic origin	0.11	0.11	0.11	4.11 0.01	-0.34 0.47	-0.81 0.13
Midwest	0.26	0.24	0.27	-2.50 0.13	0.11 0.82	-0.64 0.24
South	0.42	0.39	0.44	-5.20 0.00	-0.21 0.63	-0.56 0.28
West	0.18	0.13	0.20	-0.69 0.69	-0.24 0.63	-1.31 0.02
Suburbs	0.31	0.26	0.33	-0.64 0.59	-0.11 0.76	0.02 0.95
Nonmetro	0.28	0.25	0.30	-4.46 0.00	0.30 0.39	0.01 0.99
Household rents dwelling	0.55	0.77	0.47	-0.07 0.95	0.23 0.48	0.02 0.96
Occupies dwelling without payment	0.04	0.02	0.05	1.52 0.54	0.78 0.28	-0.04 0.96
Number with no HEI	0.43	0.55	0.39	-59.70 0.00	-6.54 0.00	-5.22 0.00
Adjusted R ²				0.90	0.81	0.66

*Dependent variable means are per person with 3-day dietary intake data.

**Numbers below estimated regression coefficients are prob values.

Fruit	Dairy	Meat	Total fat	Saturated fat	Cholesterol	Sodium	Variety
3.60	6.21	7.19	6.31	5.15	8.33	7.86	5.92
3.23	6.47	7.21	6.33	4.67	8.21	7.86	5.56
3.74	6.12	7.18	6.31	5.33	8.38	7.86	6.05
-3.18	-1.48	-1.62	0.12	2.70	-2.92	0.60	-5.00
0.02	0.24	0.09	0.93	0.06	0.02	0.60	0.00
0.01	0.00	0.00	-0.01	-0.01	0.00	-0.01	0.01
0.30	0.76	0.70	0.16	0.19	0.57	0.35	0.28
-0.06	0.32	-0.42	-0.38	-0.95	-0.65	-0.72	-0.23
0.94	0.65	0.43	0.58	0.24	0.37	0.26	0.74
-0.01	0.04	0.05	0.02	0.02	0.02	0.03	0.02
0.73	0.03	0.00	0.35	0.45	0.23	0.03	0.30
2.79	3.35	2.25	2.33	-0.33	2.49	3.09	2.09
0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.01
4.18	8.01	8.53	7.53	5.18	9.41	8.23	7.57
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-0.39	-1.10	0.41	-0.07	0.87	0.49	0.56	-0.02
0.61	0.12	0.45	0.92	0.29	0.50	0.38	0.98
1.63	-0.63	-0.40	1.11	0.96	3.04	3.39	0.84
0.01	0.29	0.38	0.06	0.16	0.00	0.00	0.16
0.19	0.22	0.05	0.04	-0.02	0.18	-0.18	0.30
0.00	0.00	0.34	0.48	0.78	0.00	0.00	0.00
-0.40	-2.70	1.06	-0.28	0.61	-0.96	-0.72	-0.57
0.45	0.00	0.01	0.56	0.28	0.06	0.11	0.26
-0.81	-3.26	-0.23	0.39	1.25	-0.91	0.64	-1.19
0.36	0.00	0.72	0.63	0.19	0.29	0.39	0.16
-0.59	-1.78	2.55	2.18	2.72	-0.08	0.18	0.08
0.38	0.01	0.00	0.00	0.00	0.90	0.75	0.90
-0.13	0.41	-0.45	-1.76	-1.79	0.84	0.81	0.12
0.85	0.52	0.35	0.01	0.01	0.20	0.16	0.86
-1.86	-1.43	0.37	-0.93	-0.41	0.23	0.59	-0.98
0.00	0.02	0.42	0.12	0.55	0.71	0.28	0.10
1.10	-0.37	-0.98	-0.74	-0.86	0.05	2.25	0.40
0.13	0.58	0.06	0.26	0.27	0.94	0.00	0.56
1.09	-0.15	-0.32	0.05	-0.84	-0.03	-0.18	-0.18
0.03	0.75	0.36	0.92	0.12	0.95	0.67	0.71
0.03	-1.27	0.16	-0.15	-0.15	-2.08	-1.26	-0.05
0.96	0.01	0.66	0.75	0.78	0.00	0.00	0.92
-0.30	0.16	0.78	-0.08	-0.68	-0.16	-0.04	0.00
0.52	0.71	0.02	0.85	0.17	0.72	0.91	1.00
0.37	-0.08	0.22	1.01	0.61	-0.60	-1.17	0.44
0.72	0.93	0.77	0.29	0.58	0.54	0.18	0.65
-3.65	-6.65	-7.15	-6.25	-4.46	-7.17	-6.27	-6.35
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.35	0.70	0.83	0.68	0.43	0.74	0.74	0.67

The average low-income household in the United States had a household-level HEI of 62.18. Food stamp households have slightly lower means at 60.70, whereas nonparticipant households are slightly higher at 62.74. With regard to components, the lowest overall component score is for fruits (3.60 of 10), and the best component score is for cholesterol (8.33). Food stamp households have lower mean component scores than do low-income nonfood stamp households for all components except dairy, meat, and fat. Food stamp households have lower mean component scores for fruit (they eat too few servings) and for saturated fats (they receive an excessive percentage of calories from saturated fats). These correspond to the highest and lowest values for the general population (12).

Sample means for the independent variables help characterize the groups. The means of the dummy (zero-1) variables reflect the proportion of the population with a particular characteristic, for example, the proportion of female-headed food stamp households is 71 percent, compared with 53 percent of all low-income households and 46 percent of nonfood stamp households. The mean income of food stamp households expressed as percent of the poverty threshold was substantially less than nonfood stamp low-income households (65.71 percent versus 87.93 percent). The average household size in TFP MAEs was 2.13, with food stamp participating households slightly larger at 2.29 than nonfood stamp households, at 2.07. The proportion of food stamp households with at least one member participating in the WIC program is 19 percent. Food stamp households receive food stamps valued at \$34.22 per week, on average.

Regression results for the 11 equations are also shown in table 2. Unlike the means, these regression results are not weighted, since many of the variables used to construct survey weights are included in the equations (8). Estimated regression coefficients are shown for each independent variable for each of the 11 diet quality measures. The level of statistical significance (prob-value) of each estimated regression coefficient is shown directly underneath the coefficient.

Interestingly, regression results indicate that the estimated effect of household income on the diet quality of the sample households was not significant at conventional levels of statistical significance. Recall that average household income as a percent of the poverty threshold for food stamp receiving households was 65.71, substantially lower than that of the nonfood stamp households (87.93).

The estimated coefficient on the food stamp participation variable is interpreted as the effect on the level of the dependent variable (HEI or HEI component) that a food stamp participating household (27 percent of households) with value of food stamp benefits equal to zero would have, other things equal. The estimated coefficient on the food stamp participation variable is negative for the HEI and all components but dairy. However, it is only significant for the HEI at the 0.03 level of statistical significance.

By contrast, the value of food stamps received has a substantial and statistically significant effect on overall diet quality, controlling for other relevant factors. For each additional dollar of food stamps received, the aggregate household HEI score increases by an estimated 0.22 points. At the average weekly food

stamp value of \$34.22, the aggregate household HEI increases 7.5 points, on average. However, since food stamp households “start” at an HEI about 3.86 points lower than similarly situated nonfood stamp households, the net effect of food stamp participation on aggregate household HEI is about 3.7 points,² on average. Not surprisingly, the positive nutritional effect of food stamp participation is larger for higher levels of food stamps, but lower for lesser food stamp benefit values. A break-even point is estimated at \$17.54 per week. That is to say, when weekly household food stamp benefits are at least \$17.54, food stamp participants demonstrate superior diet quality to similarly situated nonprogram participants. At a food stamp value of (\$3.86/.22) \$17.54 per week or lower, food stamp participants have diet quality inferior to nonparticipants. Thirty-two percent of Food Stamp Program participating households received food stamps valued at less than \$17.54 per week. With regard to the HEI components, the value of food stamps received exerts a positive and statistically significant effect on vegetables, dairy, meat, and sodium component scores.

Turning to WIC, results suggest that participation in the WIC program by one or more household members has a very strong positive effect on aggregate household diet quality measures, controlling for other factors. WIC participation alone contributes 23.45 points to the aggregate household HEI score

²The estimated coefficient of 3.86 is significant at the 0.03 level of statistical significance. However, given that no adjustments for survey design effects were made in estimating standard errors of the coefficients, it could be statistically insignificant. In fact, when the HEI equation is estimated independently from those of its components, the estimated coefficient on the food stamp value remains at 0.22 points and is significant, but the food stamp participation dummy variable coefficient is not significant.

(controlling for household size among other variables). This overall effect is distributed about evenly in all diet quality components except for vegetables and saturated fat, where the estimated coefficients are not statistically significant.

The possibility that WIC participation may improve household scores for some diet components not included in the WIC food package, for example, fruits³ and possibly vegetables, is interesting and may be explained in several ways. One is that consumption of the WIC food package (by those for whom it was intended, and possibly their families) improves diet quality scores for the types of foods that it includes, for example, dairy products and grains, as well as frees up food stamps and money income to purchase more of all foods for the household. Another, more general, explanation is that households that participate in the WIC Program are more health and nutrition oriented than are other households, including households receiving only food stamps. Finally, the nutrition education received as part of participation in the WIC Program is likely to improve diet quality through better diet-related behaviors.

Only a minority (34 percent) of low-income households was dual-headed, with food stamp participating households less likely to have both male and female heads (20 percent) than were nonparticipating low-income households (39 percent). Seventy-one percent of food stamp households were headed by a female head only, compared with 46 percent for nonfood stamp households and 53 percent for all low-income households. Compared with female-

headed households, dual-headed households have lower grains scores and higher vegetable scores, on average. Female-headed households have much higher HEI, cholesterol and sodium scores, and somewhat higher fruit and total fat scores than comparable male-headed households.

The mean highest grade of formal schooling completed by the household head was 10.59 years. Food stamp and nonfood stamp households differed little in average years of education. Regression results show that years of education has a positive and statistically significant effect on overall diet quality. Every additional grade completed increases the household HEI score by 0.81 points. Years of education has a small positive effect on fruit, dairy, and cholesterol scores, and a small negative impact on the sodium score.

Thirty-three percent of the food stamp-receiving households were African American, 8 percent were of other race, and the remaining 59 percent were White. The corresponding figures for nonfood stamp households were 19 percent African American, 6 percent other, and 75 percent White. African American households have, on average, a lower household HEI by 5.16 points than comparable White households. They also have lower dairy and higher meat scores than White households. Race does not appear to have significant effects on most of the diet quality component measures.

Hispanic households, at 11 percent of households, have substantially higher HEI scores than non-Hispanic households (4.11 points). They have higher total fat and saturated fat scores, but lower dairy scores than non-Hispanic households.

Geographic location and urbanization status have few statistically significant effects on the HEI and its components. Households in the Midwest (24 percent of food stamp and 27 percent of non-food stamp households) have poorer total fat and saturated fat scores than those in the East. Households in the South (39 percent of food stamp and 44 percent of nonfood stamp households) have lower fruit and dairy scores than those in the East. Households in the Western United States (13 percent of food stamp and 20 percent of nonfood stamp households) have lower vegetable and higher sodium scores than similar households in the Eastern region of the United States.

Households in the suburbs (26 percent of food stamp and 33 percent of non-food stamp households) have better fruit scores, while households in nonmetro areas (25 percent of food stamp and 30 percent of nonfood stamp households) have lower HEI, dairy, cholesterol, and sodium scores than similar households in the central city. Tenancy status has no significant effects on HEI or its components scores. The only exception is for households that rent their dwelling (77 percent of food stamp and 47 percent of nonfood stamp households), which have a better meat score, compared with those households that own their dwelling.

As expected, the control variable for the number of household members with no computable HEI score has an extremely strong and statistically significant negative association with the total HEI score and its components. This control variable is also responsible for the relatively high R-squared values.

³The exception is fruit juice, which is included in WIC packages.

Limitations

Several limitations are relevant when interpreting the results. First, our study is exploratory; however, household production theory and past analyses of the demand for foods or nutrients guided model specification and the selection of variables (8). Thus, the possibility of committing gross errors is reduced. Several problems remain, however. A major limitation is that the Restricted Ordinary Least Squares reduced form specification is used as opposed to a system of simultaneous equations reflecting the usual derived demands for inputs in the household production function, the household production function itself, and the final demand for health and healthy eating.

The range of the dependent variables is constructed between zero and 100 for the HEI and zero and 10 for its components, which may imply the usual estimation problems with linear probability models (9). Because an HEI is not computed for children below the age of 2 years and for infants, they are necessarily excluded from the household aggregates of the dependent variables. This could distort results, to some extent. We did not explicitly account for the survey's clustered design effects on statistical hypothesis testing. Thus, estimated "prob" values between 0.05 and around 0.01 could result in either acceptance or rejection of the null hypothesis, if tested to account for design effects.

As several variables of potential importance in influencing "healthy eating" are not available (for example, taste of particular foods, the present value of future health outcomes, etc.) and, as there may be self-selection relative to

the FSP or WIC participation, the results may well suffer from specification biases.⁴ Despite these limitations, this study provides valuable new insights into the relationship between food assistance program participation and diet quality.

Summary and Conclusions

In this study, we estimated a statistical model using the USDA Healthy Eating Index and its 10 components at the household level as dependent variables to better understand the effects of food assistance program (FSP and WIC) participation and food stamp benefit levels on the diet quality of low-income households (controlling for intervening factors). Independent variables included relevant socioeconomic variables available in the CSFII. As is typical of such studies, selection of independent variables was heavily influenced by their availability. The interpretation of their estimated coefficients can vary substantially depending on the theoretical model the researcher believes is most appropriate for the task at hand. Here, we were broadly guided by well-known household production theory and past research in selection of variables. A novel contribution to the literature is that the HEI and its components aggregated to the household level were the dependent variables. Thus, effects of FSP and WIC participation on a household level measure of the overall diet and, at the same time, its components, could be estimated.

⁴Typically, in situations such as this, a statistical correction for self-selection bias is performed. However, the procedure requires identification of variables that are highly correlated with the decision to participate in the program but not with diet quality. In practice, such variables are not readily available (see reference 4).

Results tend to be in general agreement with previous studies of diets that were based on components of the total diet, mostly nutrient intakes. These results reaffirm the effectiveness of two of the main food assistance programs, the FSP and the WIC in meeting nutritional needs of low-income households, needs that may continue after welfare reform. On average, the estimated effect of Food Stamp Program participation on the overall diet of participating households is positive. The effect increases with increased value of food stamps received, as intended.

In terms of its effect on HEI components, the Food Stamp Program had statistically significant and positive effects on the consumption of vegetables, dairy, and meat products, as well as on sodium component scores. Assuming that able-bodied adults without dependents or immigrants have similar HEI and component consumption responses to food stamp income, removal from the Food Stamp Program would result in a reduction in these scores, unless food stamp income is replaced by earned or other income.

Participation in the WIC Program by household members improved household level HEI scores dramatically. In addition, WIC participation resulted in improved scores for all HEI components except for saturated fat. Positive effects reflect the value and increased availability of in-kind foods found in the WIC food package coupled with beneficial effects of the nutrition education component of the WIC Program.

References

1. Abdel-Ghany, M. 1978. Evaluation of household diets by index of nutritional quality. *Journal of Nutrition Education* 10(2):79-81.
2. Basiotis, P.P., Guthrie, J.F., Bowman, S.A., and Welsh, S.O. 1995. Construction and evaluation of a Diet Status Index. *Family Economics and Nutrition Review* 8(2):2-13.
3. Basiotis, P.P., Johnson, S.R., Morgan, K.J., and Chen, J.-S.A. 1987. Food stamps, food costs, nutrient availability, and nutrient intake. *Journal of Policy Modeling* 9:383-404.
4. Burtless, G. 1995. The case for randomized field trials in economic and policy research. *Journal of Economic Perspectives* 9(2):63-84.
5. Cronin, F.J. 1980 (Spring). Nutrient levels and food used by households, 1977 and 1965. *Family Economics Review*, pp. 10-15.
6. Deaton, A. and Muellbauer, J. 1980. *Economics and Consumer Behavior*. Cambridge University Press, New York.
7. Devaney, B., Haines, P., and Moffitt, R. 1989. *Assessing the Dietary Effects of the Food Stamp Program—Volumes I and II*. U.S. Department of Agriculture, Food and Nutrition Service, Alexandria, VA.
8. DuMouchel, W.H. And Duncan, G.J. 1983. Using sample survey weights in multiple regression analyses of stratified samples. *Journal of the American Statistical Association* 78(383):535-543.
9. Fomby, T.B., Hill, C.R., and Johnson, S.R. 1984. *Advanced Econometric Methods*. Springer-Verlag, New York.
10. Fraker, T.M. 1990. *The Effects of Food Stamps on Food Consumption: A Review of the Literature*. U.S. Department of Agriculture, Food and Nutrition Service, Alexandria, VA.
11. Kennedy, E.T. 1997. Intervention strategies for undernutrition. In F. Bronner (Ed.), *Strategies for Improving Undernutrition* (Chapter 6). Spring Press, Hartford.
12. Kennedy, E.T., Ohls, J., Carlson, S., and Fleming, K. 1995. The Healthy Eating Index: Design and applications. *Journal of the American Dietetic Association* 95(10).
13. Kramer-LeBlanc, C.S., Kennedy, E.T., and Basiotis, P.P. 1997. Food expenditure and nutritional implications of the Personal Responsibility and Work Opportunity and Reconciliation Act of 1996. *American Journal of Agricultural Economics* 79(4):105-112.

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14. Levedahl, J.W. 1995 (November). A theoretical and empirical evaluation of the functional forms used to estimate the food expenditure equation of food stamp recipients. *American Journal of Agricultural Economics*, Vol. 77.
 15. Morgan, K.J. 1986. Socioeconomic factors affecting dietary status: An appraisal. *American Journal of Agricultural Economics* 68(5):1240-1246.
 16. National Academy of Sciences, National Research Council, Food and Nutrition Board. 1989. *Diet and Health: Implications for Reducing Chronic Disease Risk*. National Academy Press, Washington, DC.
 17. Patterson, R.E., Haines, P.S., and Popkin, B.M. 1994. Diet quality index: Capturing a multidimensional behavior. *Journal of the American Dietetic Association* 94(1):57-64.
 18. Rose, D., Habicht, J-P., and Devaney, B. 1998. Household participation in the Food Stamp and WIC Programs increases the nutrient intakes of preschool children. *Journal of Nutrition* 128:548-555.
 19. Rossi, P.H. 1996. Feeding the poor: Five Federal nutrition programs; food stamps, WIC, school lunch, school breakfast, and child care. Report submitted to The American Enterprise Institute. Social and Demographic Research Institute, University of Massachusetts, Amherst, MA.
 20. SAS User's Manual, Version 6. SAS Institute, Research Triangle Park, NC.
 21. Sorenson, A.W., Wyse, B.W., Wittwer, A.J., and Hansen, R.G. 1976. An index of nutritional quality for a balanced diet. *Journal of the American Dietetic Association* 68:236-242.
 22. U.S. Department of Agriculture, Center for Nutrition Policy and Promotion. 1995. *The Healthy Eating Index*. Report No. CNPP-1.
 23. U.S. Department of Agriculture, Food and Nutrition Service. 1998. Administrative data.
 24. U.S. Department of Agriculture, Food and Nutrition Service, Office of Analysis and Evaluation. 1996, July. Administrative data, "FY 1995 WIC Food Package Cost Analysis Estimated Average Monthly Food Package Cost for Participants in Dollars."
 25. U.S. Department of Agriculture, Human Nutrition Information Service. 1992. *The Food Guide Pyramid*. Home and Garden Bulletin No. 252.
 26. U.S. Department of Agriculture and U.S. Department of Health and Human Services. 1995. *Nutrition and Your Health: Dietary Guidelines for Americans*. Home and Garden Bulletin No. 232.

